			USN						CMRIT
First Internal Test									
Sub:	COMPUTER ORGANIZATION						Code:	18CS34	
Date:	17/12/2021	Duration:	90 mins	Max Marks:	50	Sem: III	Branch:	ISE	
Answer Any **FIVE FULL** Questions									

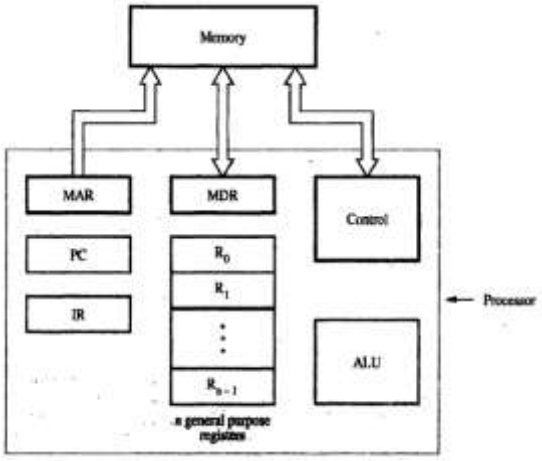
		Marks	OBE	
			CO	RBT
1(a)	Explain the steps involved in instruction fetching from memory and execution in the processor with the help of block diagram.	[5]	CO1	L2
(b)	Define the Little Endian and Big Endian assignments. Explain with relevant diagrams.	[5]	CO1	L2
2(a)	Define Subroutine. How to pass parameters to subroutine? Explain with your own Example.	[10]	CO1	L3
3(a)	What is Addressing mode? Explain any eight addressing modes with example of each mode.	[10]	CO1	L2
4(a)	What is the functional operation of DMA controller? Explain the centralized arbitration and distributed bus arbitration schemes	[2+4+4]	CO2	L2

5 (a)	Calculate the SPEC rating for the program suite under test. Running times of the program suite for reference PC and PC under test are given below:	[5]	CO1	L3
(b)	With a neat diagram, explain I/O interface for an I/O devices. What are Condition Code flags? Explain the four commonly used flags.	[5]	CO2	L2
6 (a)	Write about shift and rotate instructions with neat diagram and example of each.	[7]	CO1	L2
(b)	Explain the operation of stack with example. Write the line of code for implementing the same.	[3]	CO1	L2

Programs	Running time for reference PC	Running time for PC under test
P1	40	20
P2	100	50
P3	40	20
P4	10	5
P5	60	30

1 (a) Explain the steps involved in instruction fetching from memory and execution in the processor with the help of block diagram. 5 Marks

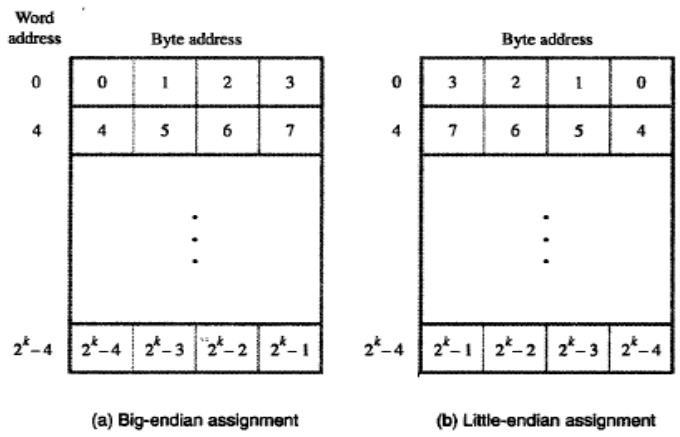
• Transfer the contents of register PC to register MAR
• Issue a Read command to memory, and then wait until it has transferred the requested word into register MDR
• Transfer the instruction from MDR into IR and decode it
• Transfer the address LOCA from IR to MAR
• Issue a Read command and wait until MDR is loaded
• Content of the PC are incremented 3 Marks



2 Marks

1(b) (Define the Little Endian and Big Endian assignments. Explain with relevant diagrams

Two ways – Big Endian and Littler Endian
Big Endian – used when lower byte addresses used for MSB of the word
Little Endian – used when lower byte addresses use d for LSB of the word 2 Marks



3 Marks

) Define Subroutine. How to pass parameters to subroutine? Explain with Example.
10 Marks

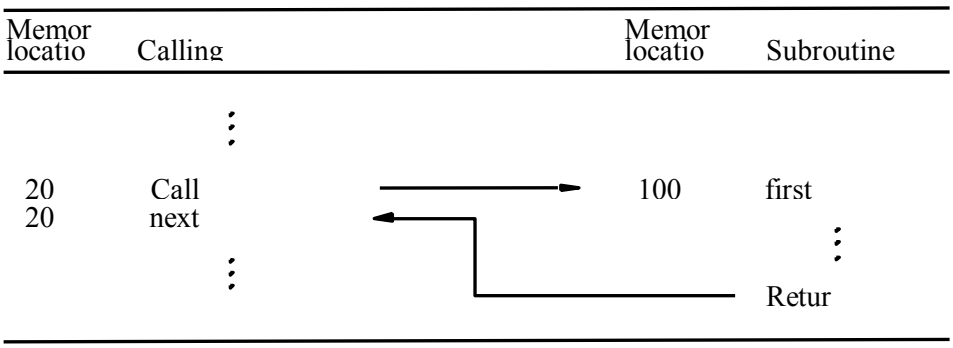
In a program subtasks that are repeated on different data values are usually implemented as subroutines. When a program requires the use of a subroutine, it branches to the subroutine.
Branching to the subroutine is called as "calling" the subroutine.
Instruction that performs this branch operation is Call.
After a subroutine completes execution, the calling program continues with executing the instruction immediately after the instruction that called the subroutine.
Subroutine is said to "return" to the program.
Instruction that performs this is called Return.

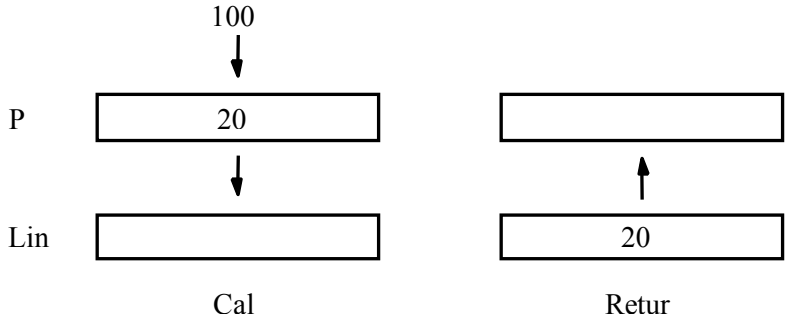
Subroutine may be called from many places in the program. 3 Marks

Example:

- Calling program calls a subroutine, whose first instruction is at address 1000.
- The Call instruction is at address 200.
- While the Call instruction is being executed, the PC points to the next instruction at address 204.
- Call instructions stores address 204 in the Link register, and loads 1000 into the PC.
- Return instruction loads back the address 204 from the link register into the PC.

2 Marks



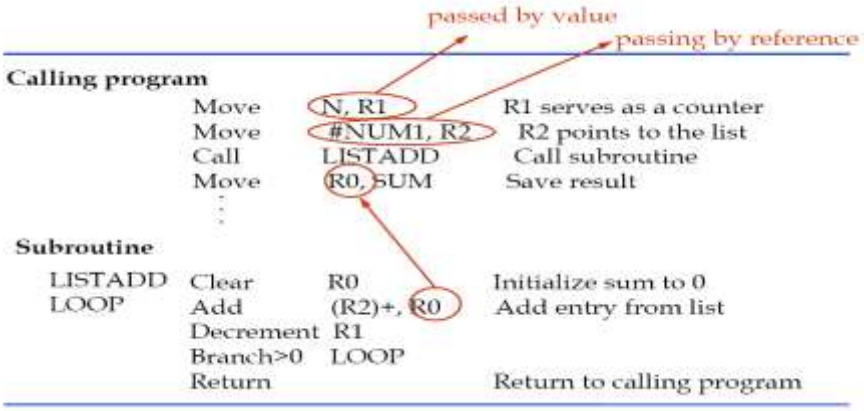


Parameter Passing:

When calling a subroutine, a program must provide to the subroutine the **parameters**, that is, the **operands** or their addresses, to be used in the computation. Later, the subroutine **returns** other parameters, in this case, the **result of computation. T**he exchange of information between a calling program and a subroutine is referred to as parameter passing

Parameter passing approaches

- The parameters may be placed in registers or in memory locations, where they can be accessed by the subroutine
- The parameters may be placed on the processor stack used for saving the return address 3 Marks



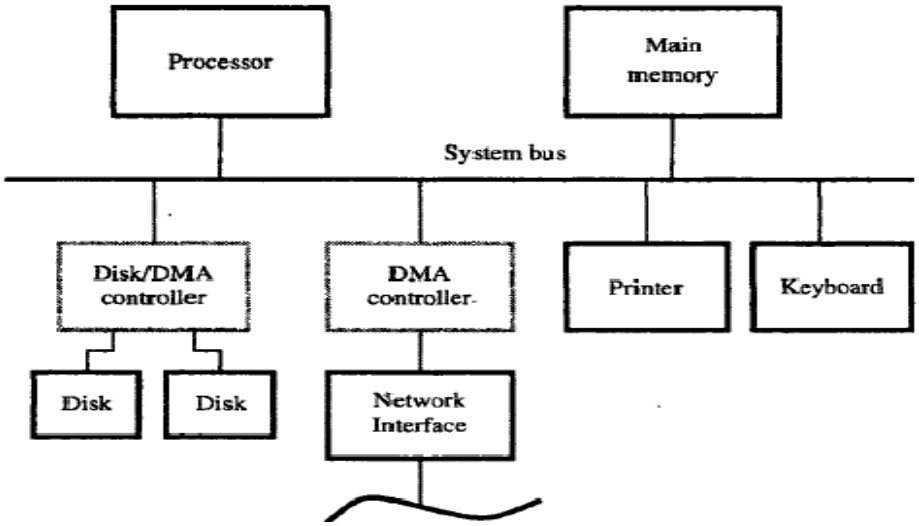
2 Marks

3.

Name	Assembler syntax	Addressing function
Immediate	#Value	Operand=Value
Register	Ri	EA=Ri
Absolute (Direct)	LOC	EA=LOC
Indirect	(Ri)	EA=[Ri]
	(LOC)	EA=[LOC]
Index	X(Ri)	EA=[Ri]+X
Base with index	(Ri, Rj)	EA=[Ri]+[Rj]
Base with index and offset	X(Ri, Rj)	EA=[Ri]+[Rj]+X
Relative	X(PC)	EA=[PC]+X
Autoincrement	(Ri)+	EA=[Ri]; Increment Ri
Autodecrement	-(Ri)	Decrement Ri; EA=[Ri]

Any five addressing modes 5 Marks
Example of each addressing modes 5 Marks

- 4. To transfer large blocks of data at high speed, an alternative approach is used
- A special control unit may be provided to allow transfer of a block of data directly between an external device and the main memory, without continuous intervention by the processor. The approach is called Direct Memory Access (DMA)
- DMA controller performs the functions that would normally be carried out by the processor when accessing the main memory. 2 Marks



3 Marks

Two approaches

– Centralized Arbitration – A single bus arbitration performs the required arbitration

- Distributed Arbitration – All devices participate in the selection of the next bus master

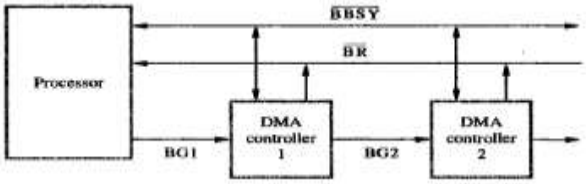


Figure 4.20 A simple arrangement for bus arbitration using a daisy chain.

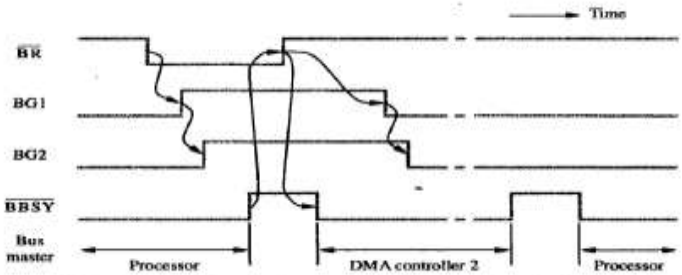
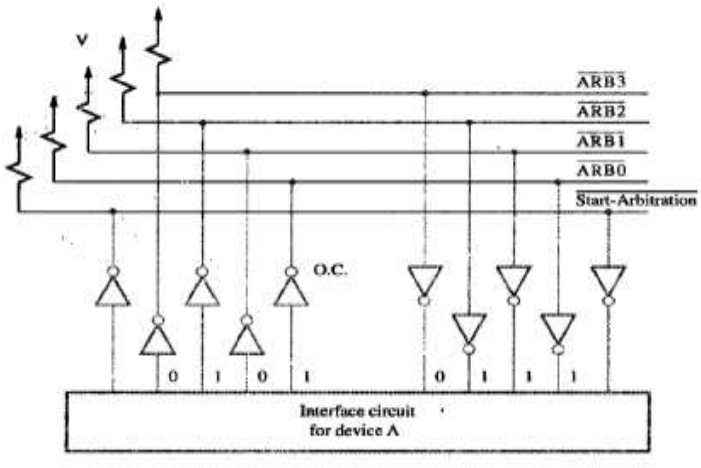


Figure 4.21 Sequence of signals during transfer of bus mastership for the devices in Figure 4.20.

3 Marks



2 Marks

5a

P1=20/10= 2 1 mark

P2= 100/50=2 1 mark

P3=40/20=2 1 mark

P4=10/5=2 1 mark

P5=60/30=2 1 mark

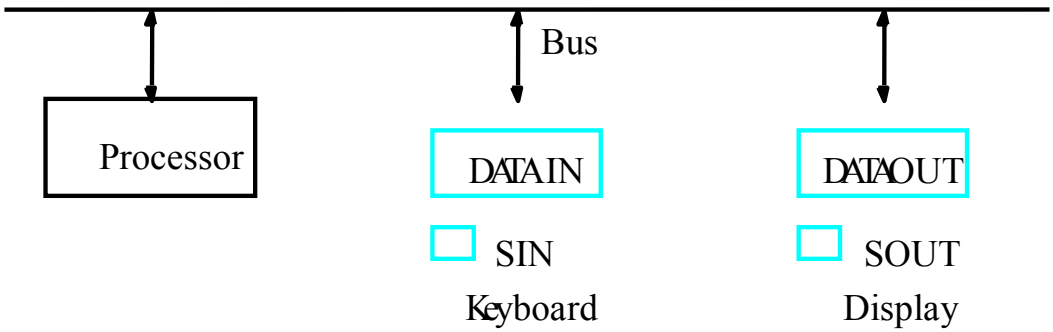
Overall SPEC rating= $(2 \times 2 \times 2 \times 2 \times 2)^{1/5} = 2$

5b. Input:

- When a key is struck on the keyboard, an 8-bit character code is stored in the buffer register DATAIN.
- A status control flag SIN is set to 1 to indicate that a valid character is in DATAIN.
- A program monitors SIN, and when SIN is set to 1, it reads the contents of DATAIN.
- When the character is transferred to the processor, SIN is automatically cleared.
- Initial state of SIN is 0.

Output:

- When SOUT is equal to 1, the display is ready to receive a character.
- A program monitors SOUT, and when SOUT is set to 1, the processor transfers a character code to the buffer DATAOUT.
- Transfer of a character code to DATAOUT clears SOUT to 0.
- Initial state of SOUT is 1.



2 .5Marks

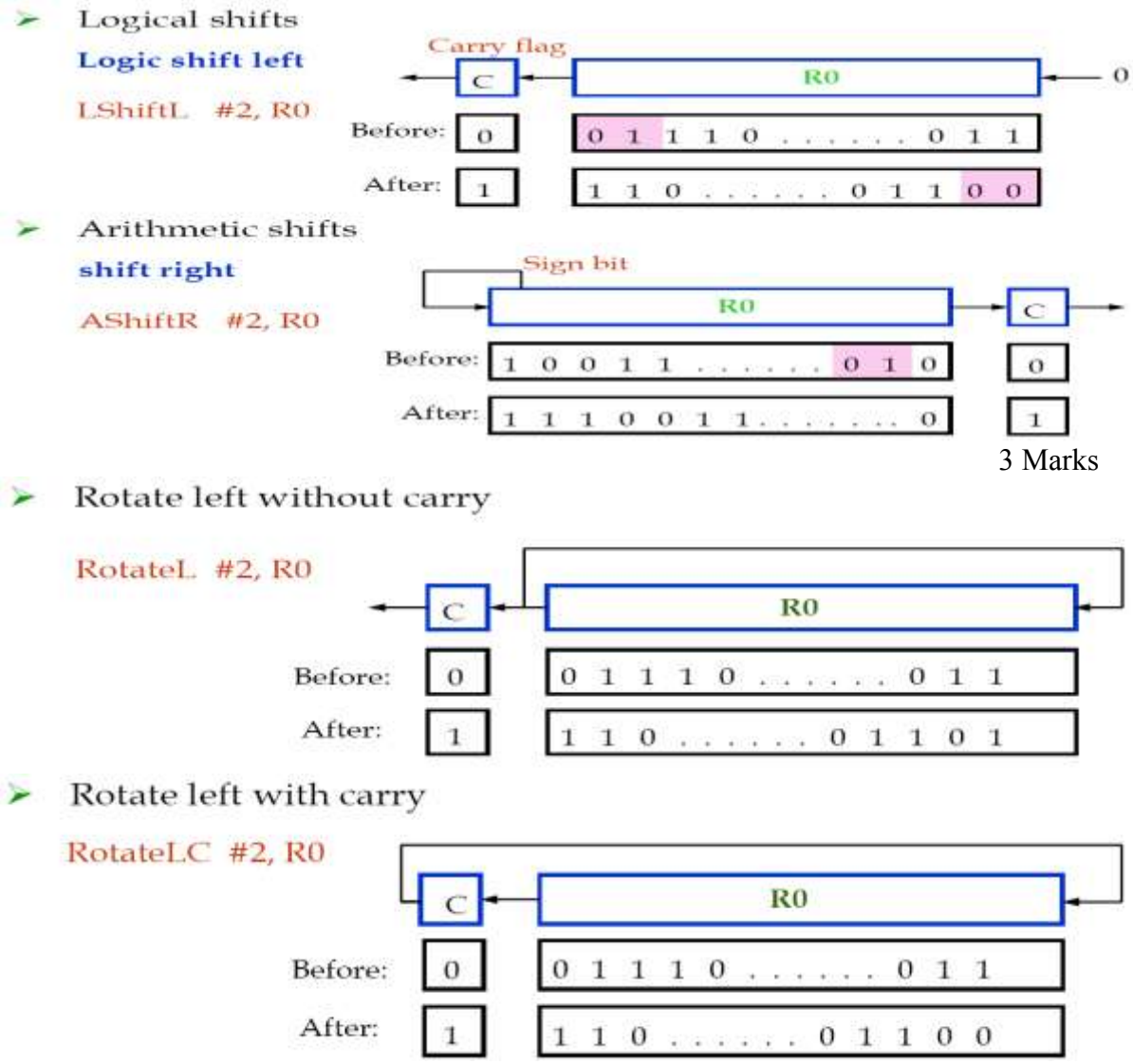
What are Condition Code flags? Explain the four commonly used flags. 2. 5 Marks

- The processor keeps track of information about the results of various operations for use by subsequent conditional branch instructions.
- This is accomplished by recording required information in individual bits, often called condition code flags
- Four commonly used flags are
  - N (negative): set to 1 if the results is negative; otherwise, cleared to 0

- Z (zero): set to 1 if the result is 0; otherwise, cleared to 0
- V (overflow): set to 1 if arithmetic overflow occurs; otherwise, cleared to 0
- C (carry): set to 1 if a carry-out results from the operation otherwise, cleared to 0

• N and Z flags caused by an arithmetic or a logic operation,
• V and C flags caused by an arithmetic operation

6.a,



3 Marks

6.b

A stack is a list of data elements, usually words or bytes with the accessing restriction that elements can be added or removed at one end of the stack. End from which elements are added and removed is called the "top" of the stack. Other end is called the "bottom" of the stack. Also known as: Push down stack. Last in first out (LIFO) stack.*Push* - placing a new item onto the stack. *Pop* - Removing the top item from the stack. 3 Marks

Example:

- Processor with 65536 bytes of memory.
- Byte addressable memory.
- Word length is 4 bytes.
- First element of the stack is at BOTTOM.
- SP points to the element at the top.
- Push operation can be implemented as:

Subtract #4, SP
Move A, (SP)

- Pop operation can be implemented as:

Move (SP), B
Add #4, SP

- Push with autodecrement:

Move A, -(SP)

- Pop with autoincrement:

Move (SP)+, A 2 Marks